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# INTERNSHIP REPORT

## The study of the use of natural playgrounds in the city of Amsterdam. Nature as playing element for children.

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# Content

# PREFACE

This Internship report is the last part of my MSc. Urban Environmental Management, majoring in Environmental Systems Analysis at Wageningen UR.

First of all I would like to thank Mr. Fred Wonenberg (Head of Environment and Health department of the Amsterdam Municipality) the possibility of joining his excellent team. I would also like to thank Dr. Frits van der Berg for his constructive supervision and his remarks and comments on my daily work. I would also like to show gratitude to Mrs. Dusanka Noot for her support on the fieldwork, which would have been rather more difficult without her presence. Besides I would like to thank the whole department of Environment and health in the Amsterdam Municipality for being so excellent hostages and make me feel as one more of their superb team.

This Internship would never have been possible without the help of Dr. Arnold van Vliet (Wageningen UR) and Jan Buijs (Pest control, Municipality of Amsterdam).

# 1. THE INTERNSHIP

This internship was carried out from 15th of April to end of August in the Department of Environmental Health (Milieu en Gezondheid) in the Municipality of Amsterdam. I was involved in a national project named “Development of an instrument to assess the practical value of municipal green/play areas” (Ontwikkeling instrument voor beoordeling gebruikswaarde gemeentelijke groene/speelplekken ), aimed to study the use of green public areas and playgrounds in four Dutch cities: Rotterdam, Zwolle, Amsterdam and Eindhoven.

Framed within the abovementioned project, my contribution was to carry out part of the fieldwork in this project. This part was to assess the use of natural playgroundsin order to obtain insight in the added value of “naturalness” to playgrounds.

I first performed a literature search and review to acknowledge the state-of-science of relevant topics to the project. Based on that, I developed a methodology to assess the use and quality of the natural playgrounds in the city of Amsterdam. After this step, fieldwork was carried out aimed to have a first source of data and analysis and also to test the feasibility of the developed method. Finally a statistical analysis was needed to find out associations and relationships between the use of the playgrounds and other variables.

# 2. INTRODUCTION

## IMPORTANCE OF URBAN GREEN AREAS

Since they are in more mature state, cities in developed countries have moved from "brown" or "grey agenda" –i.e. promoting sanitation and pollution removal, respectively - towards strategies that promote the "green agenda"-i.e. promoting green areas- (Sorensen and Okata, 2011). Green agendas focus on the extension of the green infrastructure and on the increased provision of valuable ecosystem services (Cameron et al., 2012a; Hirokawa, 2011; McGee Iii et al., 2012; Schäffler and Swilling, 2012; Walker et al., 2012).

The urban green infrastructure provides ecosystem services, which are "the benefits that people derive from ecosystems" (Millennium Ecosystem Assessment, 2005). Within this type of development of urbanization, more people living in urban environments requires more provision of ecosystem services lead to an increased demand of (the benefits of) ecosystem services. Much research has been carried out on ecosystem services and the benefits provided by the urban green infrastructure such as carbon storage (Davies et al., 2011) and regulating services. Some services such as climate regulation (Cameron et al., 2012b) and air quality regulation (Larondelle and Haase, 2013) also lead to energy savings, positive impacts in the improvement of public health (van Dillen et al., 2012; van Herzele and de Vries, 2012) and social cohesion(Bennet et al., 2012; Groenewegen et al., 2012); but this is still controversial (e.g. Bennet, Yiannakoulias et al. 2012).

However, one of the most important ecosystem services given by urban green areas to the citizens is the recreation services(Payne and Johnson, 1985). Even though children –and other city dwellers- could carry out their recreational activities in a variety of public spaces, it has been shown they prefer to recreate in a more natural environment (Fjørtoft and Sageie, 2000).

The importance of recreation services in green areas has been demonstrated to be significant for the improvement of citizens' health (de Vries et al., 2003; Maas et al., 2009; Maas et al., 2006), particularly in children's' motor control (Fjørtoft, 2001; Strong et al., 2005). Also outdoors play helps children to develop other aspects such as social skills and important social and psychological abilities(Arbogast et al., 2009). One of the most important indirect effects of recreation is the rise in physical activity (PA), which has been

decreasing over time (Rehrer et al., 2011). This decrease in PA of children leads to health consequences now (Wilson and Sato, 2013) and in the future (Fontaine et al., 2003).

Different public urban spaces are available to carry out recreational activities, but green areas seems to be preferred by citizens and children (Hino et al., 2010). The use of nature for recreational purposes would have complementary benefits(von Benzon, 2011) such as psychological (Wells and Evans, 2003) and cultural (Nordström, 2010) benefits. Children playing in green areas are expected to develop more awareness with nature in the future.

The added value of nature to playgrounds was an important reason to create natural playgrounds in the city of Amsterdam. However there is not a systematic assessment of the use of these natural playgrounds. This work is a pioneer attempt to fill this knowledge gap.

The study took place during the summer 2013 in the city of Amsterdam. Amsterdam has a population of about 780,000 inhabitants (CBS, 2010), being the biggest city of the Netherlands. According to the available statistics (Bureau Onderzoek en statistiek 2012), there are over 160,000 young people aged between 0 and 20 years old living in Amsterdam; some 90,000 are between 0 and 12 years old .

In accordance with the European urban tendencies, the number of children has decreased during the XXth century, with a parallel increase in the number of cars. These two trends have lead to a loss of public space for children to play (Karsten, 2005).

Public space plays a main role when keeping and improving social networks amongst citizens, particularly children (Karsten, 2003a, b, 2011). During this and previous centuries, several waves of emigrants coming from different parts of the world have arrived to Amsterdam. Nowadays non- Dutch background children represent an important percentage of the total number of children in Amsterdam. This dynamic, in combination with the abovementioned trend, added to a growing segregation eroding social capital (Karsten, 2011). Therefore the enhancement of public spaces where children like to play is also important from a social perspective. But also it has been shown that citizens living in less favored neighborhoods have more risk to have metabolic disorders related to the lack of physical activity(Gundersen et al., 2011).

Consequently I have chosen playgrounds located boroughs in Amsterdam with a low average socio-economic status:  West, Nieuw West and Oost.

## 3. AIM OF THE INTERNSHIP

A natural playground is an area where children can play and interact with natural elements such as sand, water, vegetation or animals. In its general form, in natural playgrounds "the equipment is made of recycled logs, and the general aesthetic is of a woodland glade where children can frolic amid nature in a thoroughly wholesome way" (NaturalPlaygrounds 2012).

The aim of the project is to study the use of natural playgrounds in Amsterdam and the factors that might influence this use. Two specific important points here are 1) How does children's outdoor play contribute to their Physical Activity and 2) Do natural playgrounds stimulate outdoor play. In fact, there is currently a lack of information about to what degree and in which way natural playgrounds are being used.

Therefore, based on scientific literature, a structured-observation tool will be developed in order to assess the use as objectively as possible.

The aim of the internship could be resumed in these three research questions:

1. Does the presence of nature stimulate the use of playgrounds in Amsterdam?
2. Do Natural elements to play with stimulate play?

Additional questions that can be addressed are:

3. What are the factors that influence the use of the natural areas?
4. How far do people walk from in order to go to the park (calling effect)?

However the main personal and educational objective of this internship is to learn how an urban environmental health and public institution like GGD works. This experience may be of high value for the next steps of my career.

## 4. METHODS

In order to reach the abovementioned objectives and goals, the internship was divided in different methodological stages. These stages overlapped in time, carrying out occasionally two different methods at the same time. The general process can be chronologically divided in 1) Literature review; 2) Development of assessment and observation tools; 3) analysis of the results.

Amsterdam has a great number of playgrounds with different shapes, design and target age. Due to a lack of a central database of the playgrounds present in Amsterdam, the selection of these playgrounds attended to the information we could gather on the web. Also city boroughs did not provide with further information. Therefore from 14 playgrounds available in a list found in internet we chose a total of 10 playgrounds located in the districts of Amsterdam Oost, Amsterdam Niewe West and Amsterdam West. With this selection we ensured to have all kinds of playground according to the given definition of naturalness.

Built mostly in the second half of the XXth Century (Verstrate and Karsten, 2011) most of Amsterdam playgrounds have not any natural element. The playgrounds of Steve Bikoplein and Jouberstraat are an example of this common type of non natural playground –usually located in non-Dutch high dense population. They were chosen not to count and observe children, but to ask the parents about their opinion of naturalness and how far they come from.

| Name | Location |
|---|---|
| Natureluur | Nieuw West |
| Natuurspeeltuin Plan West | Niew West |
| Oosterpark | Oost |
| Natuurspeeltuin Willem de Zwijgerlaan - West | West |

| | |
|---|---|
| Flevopark | Oost |
| Natuurspeeltuinen Oost | Oost |
| Park Frankeandael | Oost |
| Steve Bikoplein | Oost |
| Jouberstraat | Oost |
| Woeste westen | West |

Table 1 Name and location of chosen playgrounds

Figure 1 Location of the chosen playgrounds

## 4.1. LITERATURE REVIEW

The first phase was aimed acquire a knowledge background by literature review. This was done by means of commonly used search engines such as Scopus and Web of Science. I read relevant articles dealing with topics related to the aim of the project. Particularly the search was focused on: urban parks and their use by children, as well as the benefits –i.e. health, recreation- that green areas bring to city dwellers.

In general the features cited in literature that influence the use of green areas by children can be divided in physiological, social and environmental factors(Rehrer et al., 2011). The factors listed below are, according to literature, the most relevant factors that influence the use of (natural) playgrounds by children:

- **Quality of natural playground** (Hillsdon et al., 2006; Pikora et al., 2002; Tappe et al., 2013; van Dillen et al., 2012)
    - Size(Cohen et al., 2010; Kaczynski et al., 2008)
    - Light
    - Kind of nature
    - Number of functional Units
    - Natural availability
    - Environment (surroundings)
    - Accessibility
    - Maintenance
    - Visual quality
    - Cleanliness
- **Physical surroundings** (Wilcox et al., 2000)
- **Activities performed in the park** (Cohen et al., 2010)
- **Safety** (McCormack et al., 2010); but (Cohen et al., 2010)
- **Children's health**
- **Proximity or availability** (Sallis et al., 1998; Sallis et al., 1990)
- **Parent's opinion** (Refshauge et al., 2012)
- **Urban (neighbourhood) form** (Siu et al., 2012)

- **Kind of green area** (McCormack et al., 2010; Rehrer et al., 2011)
    - Formal
    - Informal
    - Natural
    - Playground
- **Socio economic characteristics** (Patterson et al., 2004; Reed and Hooker, 2012; Wilcox et al., 2000)
    - Ethnicity
    - Age
    - Family's income
    - Education
    - gender

## 4.2. QUALITY AND USE ASSESSMENT TOOLS DEVELOPMENT

There is a range of literature and instruments developed to study the use of playgrounds and public space and also their quality. The most influential tools aimed to assess the quality of the public space were the ones developed by Pikora et al. (2002) and Coombes et al. (2010). Also other tools such as BRAT-DO (Bedimo-Rung et al., 2006), CPAT (Kaczynski et al., 2012) and EAPRS (Colabianchi et al., 2011).

In order to assess the activities performed by children other tools were used. Such tools are and SOPLAY (McKenzie et al., 2000) and IGOR method –developed by GGD.

### *4.2.1. PLAYGROUND QUALITY*

The quality of the physical environment is a fundamental variable enhancing – or decreasing- its use (Colabianchi et al., 2011; Owen et al., 2000). There are some instruments developed in literature with the aim of assessing physical quality. For instance Pikora et al. (2002) developed a Systematic Pedestrian and Cycling Environmental Scan (SPACES) aimed to measure the physical environmental factors that influence walking an cycling at a neighbourhood scale. Also Coombes et al. (2010) analyzed the quality of the public space and measured physical activity of subjects in relation to green space accessibility and use.

The BRAT-Direct Observation (BRAT-DO) is a paper-and-pencil instrument used to visually identify and evaluate the physical characteristics of parks. It divides the observations in target areas and treats them independently.

The Community Park Audit Tool (CPAT) is a tool with the objective to enable diverse community stakeholders to audit local parks for their potential to promote physical activity in youth. The tool includes four sections – Park Information, Access and Surrounding Neighbourhood, Park Activity Areas, and Park Quality and Safety.

The EAPRS Measurement Tool provides a comprehensive direct observation assessment of the physical environments of parks and playgrounds, with an emphasis on evaluating physical elements and qualities with respect to their functionality or potential functionality (e.g., how a park or playground element is used or could be used by adults and children).

This project's singularity is the need to assess the relationships between 1) nature and 2) use of the playgrounds. Therefore I took different elements from these instruments and adapted them to this case study. In this project I will develop a new quality assessment tool to evaluate the state of the natural playgrounds (see appendix 1).

The developed quality tool consists of several different parts, each of them referring to different factors shown to be important according to literature.

In this tool I addressed 1) general park information (whether there is information available, etc.), 2) general cleanliness of the playground 3)accessibility to the playground 3) aesthetics of the surroundings 4) services and facilities present at the park 5) playing facilities 6) safety issues 7) naturalness of the playground.

After this general assessment, I divided each playground in different sub areas or functional areas. Each functional area had an element of unity usually consisting on the same soil (e.g. sand, grass, etc.), a specific playing device or the same use.

### *4.2.2. USE ASSESSMENT*

According to Kumar (1999), observation is a "purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place". Non-participant observation mode was applied in this research. Under this observation type, the observer does not get involved in the group activities; rather he/she remains a passive observer.

After the observations of the physical environment, children's activity was measured combining IGOR method (see appendix) with the System for Observing Play and Leisure Activity in Youth (SOPLAY) method. From the SOPLAY method we took specific parts from methodology, for instance to divide functional areas or the systematic procedure of counting. A visualization of the available videos was done in order to have an extra burden of practice in observation.

The aim of the observations was to systematically count and classify the number of children present in each functional area and describe their activities.

Age was divided in three different groups: toddlers (1 up to 2 years), children (2-12) and teens (12-onwards). After counting the number of persons in each age group, the activities being performed were recorded. These activities were Football (F), Biking (B), General Play (GP), General Play with/in nature (GPn), Playing equipment (S), Natural Playing equipment (Sn) and Inactive (I). The definitions of each activity were stated as follows:

F: Football. Any activity in which a football ball is the main playing element.

B: Biking. Any activity in which a bike is the main playing element.

GP: General Play. All playing activities performed by the children that do not concern any particular playing element nor ball sports and biking.

GPn: General play with nature. The same as above, but when the children are in direct contact or in direct use of natural elements. (i.e. climbing trees, playing with sand/ water).

S: Playing equipment (Speeltoestel) . Any playing activity performed by children carried out in a playing device.

Sn: Natural playing equipment. The same as above, but when the playing device has a natural character (i.e. recycled logs)

Inactive: absence of any notable activity.

The observations were made from middle June until middle July. Each playground was visited a minimum of 6 times between 13.00 h and 18.30 h.

### *4.2.3. QUESTIONNAIRES*

Aimed to know parent's opinions concerning the natural playground, I decided to carry out small structured interviews. The survey/interview consisted of two different parts (see appendix). Firstly I asked about the reason(s) for what they go to this specific playground, for how long do they stay and what are the advantages of this playground with respect to other playground(s) frequently visited.

In the last part of the questionnaire I asked the parents to state the importance of different natural aspects that characterize a natural playground. Due to some difficulties it was modified during the fieldwork. The main reason was our acknowledgement of parent's difficulty to distinguish between the elements targeted (e.g. quality of nature). Also we could appreciate some duplicity of the questions asked.

Therefore the next version was improved, asking the four statements that follow:

- the importance of the playground and/or its surroundings being green
- the importance of differences in ground level
- the importance that their children can play and interact with nature
- the importance of a natural ground surface

The parents should assign a mark ranging from 0 (not important), 1 (neutral), 2 (important) and 3 (very important) to each question concerning the above mentioned elements.

## 4.3. METHODOLOGY FOR THE PLAYGROUND DESCRIPTION

There is not generally accepted or official definition for natural playgrounds. Therefore we will talk about the grade of "naturalness" of a certain playground. Based on literature and experience, some of the characteristic elements of natural playgrounds are:

- Variety and amount of trees, vegetation (playground + surroundings)
- Topography, hills
- Possibility to play with nature: Plants, water, sand.

- Ground: asphalt, soil, sand

Consequently, the naturalness of a playground will depend on several factors. Also, a two playground can be more natural in different ways, e.g. because of more vegetation or because of more natural playing elements. In principle, when a playground has more of abovementioned elements, the more natural it will be.

The outcome of this classification is be the development a spider diagram, which in a very graphic way will help to assess this naturalness (figure 2). In order to simplify the analysis and make it more intuitive, the variety and amount of vegetation at the playground was combined with the surroundings. For instance, it is assumed that a playground located in a park has more variation in trees than that same playground located at a street without trees. Note that the elements are basically the same as the ones asked to the parents. The rationale of this is to have the possibility of doing the same diagram with the parent's opinion.

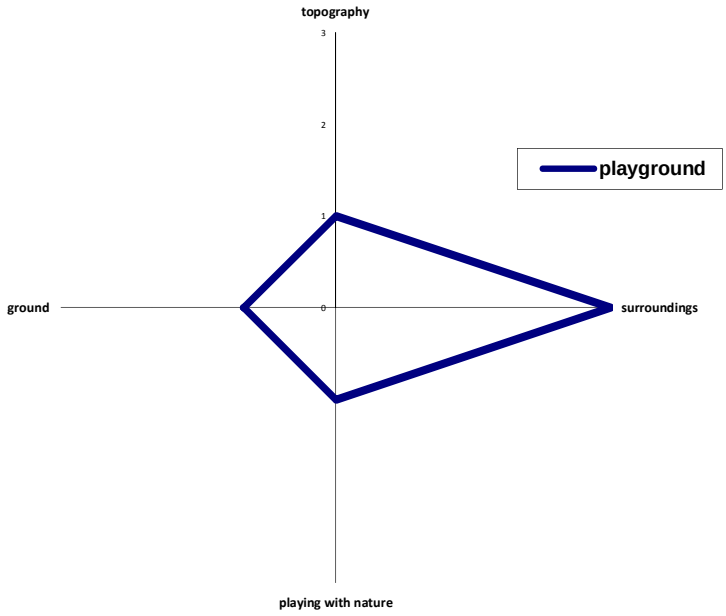



Figure 2 Example of Spider diagram

| Score | Playing with nature | Ground | Topography | surroundings |
|---|---|---|---|---|
| 1 | Children cannot play with none of three natural elements: water sand or vegetation. | Artificial | No variation in the topography | Urban |
| 2 | Children can play with at least two. | Some parts artificial (including paths) and some natural. | Small trenches, the overall impression is flat with small variations in the topography | Semi urban |
| 3 | Children can play with all three elements or more | The whole playground presents a natural surface | The whole area is irregular, and flat zones are not representative | Park or natural area |

Table 2 Spider diagram's score definitions

# 5. RESULTS.

## 5.1. PLAYGROUND DESCRIPTION

### *5.1.1. Amsterdam- Oost.*

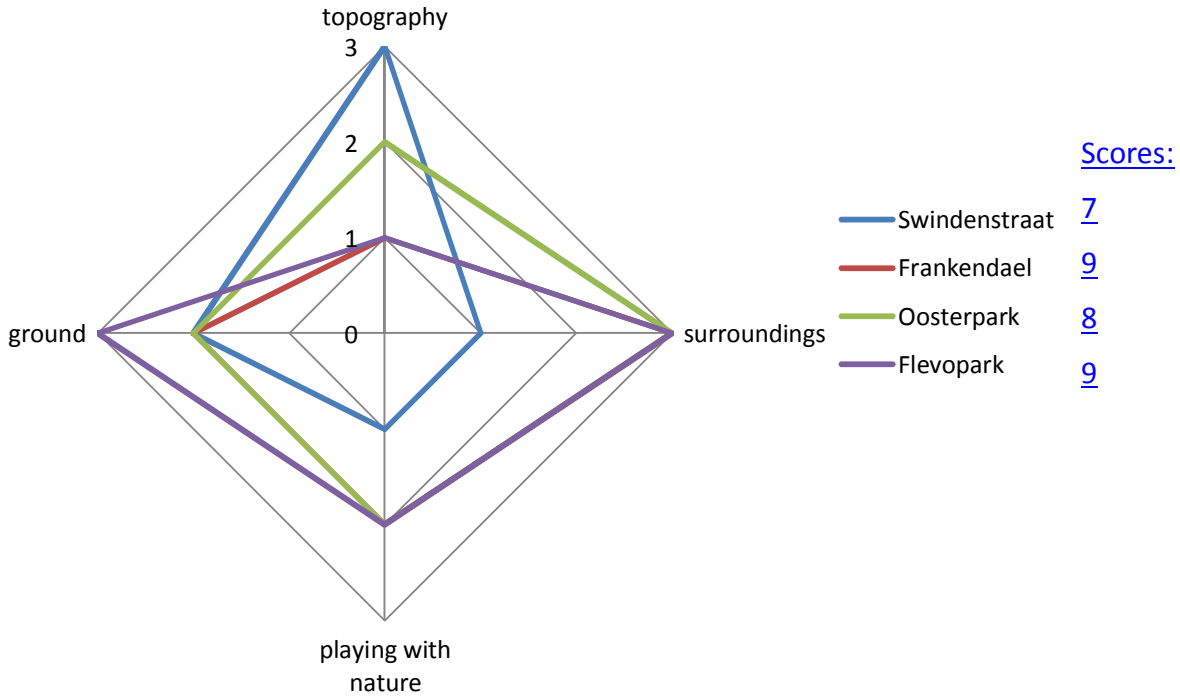



**Figure 3 Spider diagram of playgrounds located in Amsterdam-Oost**

In Amsterdam- Oost I selected four natural playgrounds differing on its naturalness character. Also the neighbourhood social characteristics differ from playground to playground. For instance Swindestraat is frequented by non-dutch people and Frankendael seems to receive the visit of young mid-class Dutch couples with their children. A combination of both extremes might be Oosterpark and Flevopark, where one could find a broad spectrum of social backgrounds.

In this paragraph I will describe each natural playground according to the Natural Playground Assessment Instrument (NPAI) developed for this project. This tool assess the most important elements which can influence the use of a playground: cleanliness, accessibility, services, number of functional areas, information available and facilities (see appendix).

5.1.1.1. Flevopark

Flevopark is located in the district of Indische Buurt, in the park with the same name. It has an area of 0.27 ha (Google Earth 2012). The playground has a map at the entrance stating the different elements present. The general park cleanliness is good, and the general maintenance of the playground's nature and elements is good. The playground is also well accessible even if it has a small fence (not in a very good state) in order to avoid toddlers to escape. Apparently an important fact for the success of a playground is the existence of concession stands; here we can find a small café with a variety of products being sold.

A previously commented the naturalness of the playground consists in the surroundings, which have a great variety of trees and bushes. But also the ground is natural, without any artificial spot. Children can also interact and play with nature; in this particular case climbing in trees and playing with sand.

I divided the playground in three different functional areas, where the areas number 2 and three have the natural elements children can play with, the tree and the sand, respectively.

5.1.1.2. Frankendael

Frankendael is located in the district of Amsterdam Oost. It has an area of 1.5 ha. There is a variety of functional areas and possibilities to play which makes it very interesting for parents (and children). The general park cleanliness is good, however the maintenance of some of the playing devices is poor. The accessibility to the park is good, even though some functional areas are hidden and not well indicated.

Frankendael consists on 7 different functional areas. Area 1 is an enclosed sand box with play devices mainly designed for toddlers or young children. This is one of the most popular areas in the playground. The big grass field surrounded area 1 was divided into areas 2 and 3. Rather than having different characteristics the main reason was it would facilitate the counting. These two areas are basically green grass fields where parents can rest and children can play. Area number 4 is an irregular space -topographically talking- with some scatter vegetation. It is mostly used for scouting activities. Next to it I split area number 5, which has the distinctiveness of a water fountain disposed. Area 6 is the most natural. It is located in a hidden part of the park, surrounded by bushes and trees. Here the children can

play with devices made of recycled logs. This area lacks in benches though, which is a remarkable fact that could have consequences on its use. Near area 6 there a space consisting on unmanaged land, mostly riparian vegetation and which apparent level of wilderness is high. This area was not taken into consideration as it is not part of the playground, however there were observed children playing with the nature. Finally, area 7 was stated around a source of water, being only used –a lot- in the warmest days.

#### 5.1.1.3. 2e van Swindenstraat

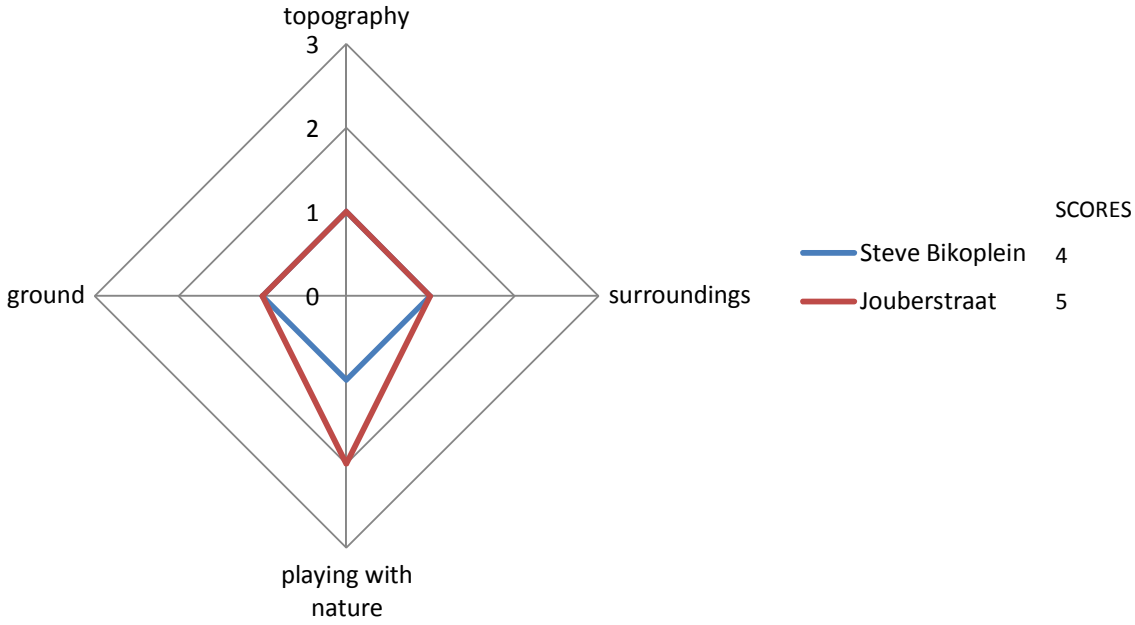
The playground at the 2e van Swindenstraat 200 is an urban natural playground located in a vacant space, which also is the reason why it is one of the smallest studied playgrounds 0.03 ha. The park is completely fenced, with the only existence of one door. The general state of the playground is good, with landscaping elements in the form of flower beds and pruned bushes. The ground is only partially natural; however it is very irregular due to a very prominent central hill dominating the park.

#### 5.1.1.4. Oosterpark

Oosterpark is a well known Amsterdam park located in the district of Oost. There is a 0.71 ha playground located in the northern side of the park. It is provided with a wide range of playing devices and functional areas. The playground is completely fenced, with two entrances. It seems to be some safety issues with the existence of a homeless' meeting point close by. The provision of services and facilities is very limited, with the only presence of a caretaker. The cleanliness is also a weak point of the park, the same as the overall state of the playing devices – some of them need urgent reparation. The division of the areas was sometimes made for counting reasons (areas 1, 2, 7, 8, 3 and 6). These zones have similar characteristics, equipped with several playing devices and the same soil surface. The natural elements of this park –in addition of the surroundings- are a sand box (area number 4) and the natural ground. It is interesting to mention that there is also a field of football and tennis.

5.1.1.5. Steve Bikoplein and Jouberstraat.

Steve Bikoplein and Jouberstraat were only taken as case study to assess the parents opinions about the natural factors and from where did they travel. The naturalness of these playgrounds is very limited, with the only exception that Jouberstraat has a small area where children can play with nature. Both playgrounds are located very close in the same district, which is a very urbanized area.




### *5.1.2. Amsterdam- West.*

In Amsterdam west there is one of the most representative natural playgrounds for children in the city of Amsterdam (also in The Netherlands). Woeste westen is a perfect example of a natural environment where children can fully interact with a broad range of natural elements and playing devices. Besides it has an environmental education office and scouting activities aimed to rise the environmental awareness of children. On the other hand Willem de Zwijgerlaan is a more urban playground but still with natural features within it. Dutch nationals are predominant in Woeste weste, whereas in Willem de Zwijgerlaan the majority of the people have other backgrounds.

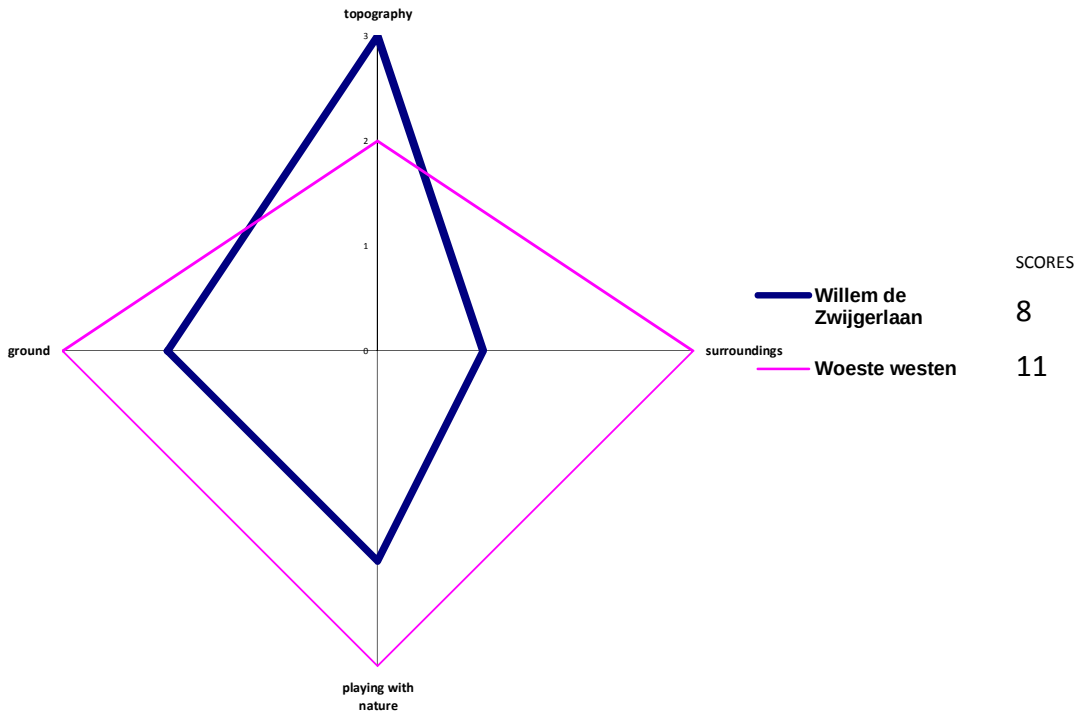



Figure 4 Spider diagram of the playgrounds located in Amsterdam-West

5.1.2.1. Woeste westen

As said above, Woeste Weste is one of the most natural playgrounds within the present research. The playground is located also within a natural setting such as Westerpark and has an area of 1.61 ha. According to the staff working there, Woeste Weste is one of the Netherlands' most visited natural playgrounds. Children can do "adventure" activities within it due to the originality of its devices. These devices are all of them recycled items. The natural elements children can play with and within are water (they can swim, sailing, fishing, etc.) and different kinds of vegetation (trees, bushes, etc.). With the supervision of the staff of the playground the can also play using fire. It is also possible to buy food and drinks in the concession stand. The weaknesses of the playground could be the absence of toilets and a poor amount of benches to sit. However visitors did not seem to be very concerned about this point.

5.1.2.2. Willem de Zwijgerlaan

The playground Willem de Zwijgerlaan is a medium size playground -0.28ha- with some natural features. The fact of being located in an urban area limits its naturalness. However it has a great hill situated in the playground's central area where children can climb. The ground surface is mostly natural, made by sand and grass. There is also 6 types of playing devices, mostly made from recycled materials.

### *5.1.3. Amsterdam- Nieuw West.*

Near to the West, Nieuw West has , together with Woeste westen, one of the most natural playgrounds named Natureluur. Plan West is a more urban-character natural playground, situated in the core of a neighbourhood.

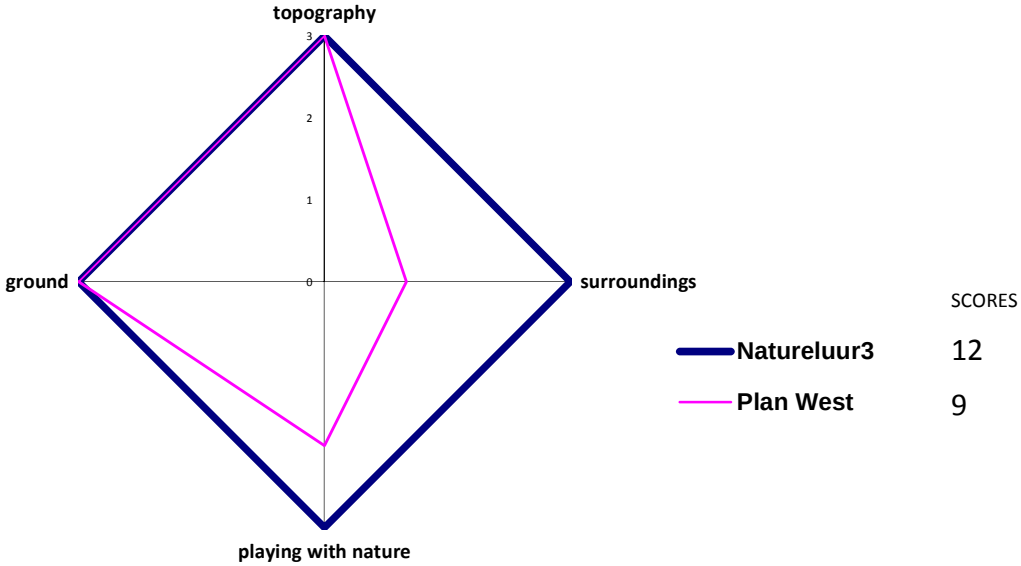



Figure 5 Spider diagram of the playgrounds located in Amsterdam-Nwest

5.1.3.1. Natureluur

Natureluur -0.91 ha- is objectively the most natural playground in Amsterdam (that I have seen) (see figure X). It has the possibility for children to play with water, sand and vegetation as well as different adventure activities. Besides the terrain is very uniform and children can climb and walk through small hills and trenches. In addition, Annex to the playground there is a environmental education centre, however it seems they do not do as many activities as in Woeste Westen. Another weak point of Natureluur is the lack in toilets and concession stands. Also the accessibility is not good from the nearest neighbourhood, which exclusively in a not well illuminated bridge. A common weakness with Woeste weste is the absence of benches, but apparently the people coming to these types of playgrounds do not need a special device to seat.

5.3.1.2. Plan West

Plan West is located in the nucleus of a neighbourhood, concretely in the street Van Spijkstraat. It is enclosed within a block of buildings and it only has one entrance, limiting its area up to 0.15 ha. In the entry it is not stated the opening hours, when the playground does not open every day of the week. It is a very complete playground for children from different ages, since in addition to the natural area, there is a football court and other activities such as table tennis.

The natural playground is small but very complete with a variation in trees and bushes as well as sand and different topographical elements. There is also an employee watching and controlling the children, fact very appreciated by the parents.

There are enough benches in all around the natural playground, and they are distributed uniformly.

## 5.2. Observation results

According to the method to characterize the naturalness of a certain playground, the degree of naturalness is the one that follows: Steve Bikoplein (4), Jouberstraat (5), Swindenstraat (7), Frankendael (8), Willem de Zwijgerlaan (8), Oosterpark (9), Flevopark (9), Plan West (9), Woeste Westen (11) and Natureluur (12).

Due to certain constraints –see section 6.3. - Not all the playgrounds were visited the same number of times. Table 3 shows the number of children (girls and boys) and toddlers present in the different playgrounds. Also the activities performed by them are characterized. Comparing the results with previous studies (Karsten, 1998, 2002, 2003b), traditional sports (football, biking) are underrepresented in all the playgrounds where observations were made.

The most used playground is Frankendael followed by Woeste westen and Natureluur. However taking into consideration the location of Natureluur, which is located in a more dense populated area than Woeste westen, we could think it would be far from its potential use. This might be due to previously commented factors such as a bad accessibility and the lack of services.

| Playground | toddlers | children girls | children boys | total children | F | B | GP | GpN | S | Sn | Inactive |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Swindenstraat | 0 | 3 | 3 | 6 | 0 | 0 | 1 | 0 | 1 | 2 | 2 |
| Frankendael | 4 | 15 | 20 | 35 | 6 | 1 | 6 | 10 | 4 | 4 | 8 |
| Willen de Zwijgerlaan | 1 | 4 | 4 | 8 | 0 | 0 | 0 | 2 | 0 | 4 | 3 |
| Oosterpark | 3 | 7 | 8 | 15 | 1 | 0 | 1 | 4 | 10 | 0 | 2 |
| Flevopark | 4 | 5 | 5 | 10 | 0 | 0 | 1 | 4 | 5 | 0 | 2 |
| Plan West | 1 | 5 | 6 | 11 | 1 | 1 | 0 | 5 | 2 | 0 | 3 |
| Woeste Westen | 1 | 17 | 15 | 33 | 0 | 0 | 0 | 19 | 0 | 5 | 10 |
| Steve Bikoplein | - | - | - | - | - | - | - | - | - | - | - |
| Jouberstraat | - | - | - | - | - | - | - | - | - | - | - |
| Natureluur | 3 | 3 | 14 | 17 | 0 | 1 | 1 | 8 | 0 | 5 | 3 |
| TOTAL | 18 | 60 | 75 | 135 | 8 | 3 | 10 | 53 | 22 | 20 | 34 |

Table 3 Children observed in natural playgrounds: average numbers per day

On the other hand, the difference in the presence of boys and girls is not as big as expected from previous studies (see for example Karsten, 2002, 2003b). There are on average 25 % more boys than girls per day –figure 6.

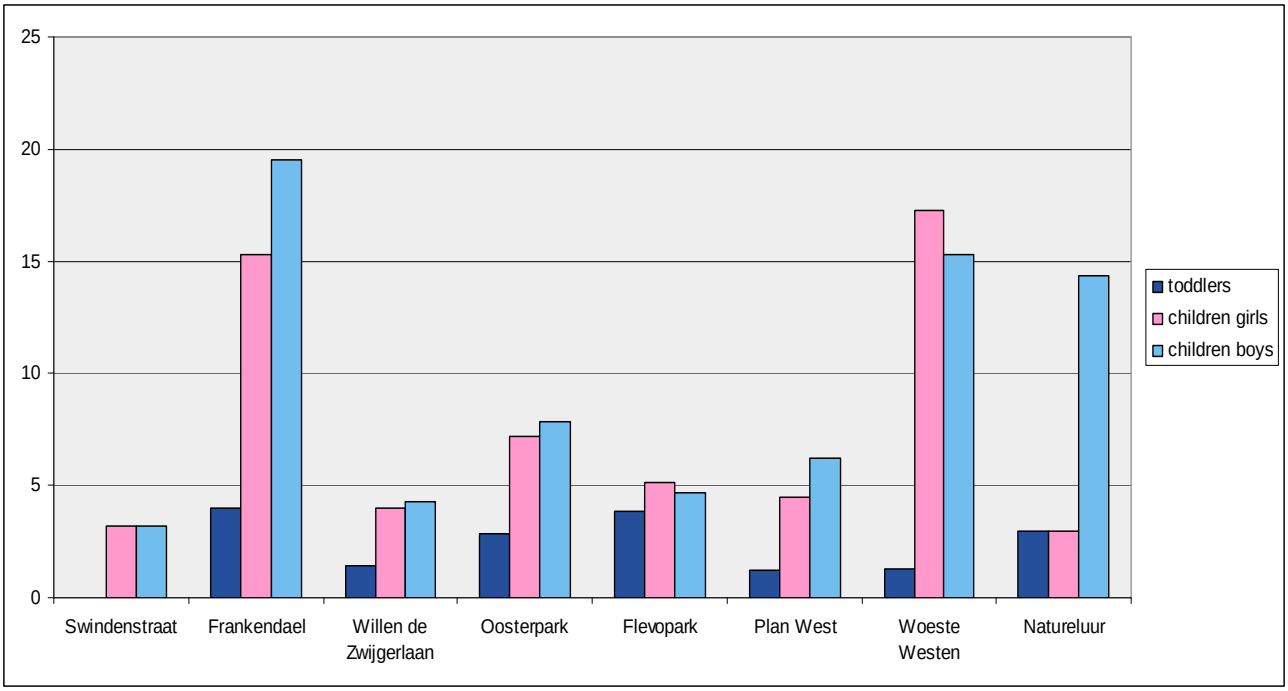



Figure 6 Playground's usage by gender

Moreover in Woeste westen there is more average of girls than boys. On the other hand it is remarkable the difference between girls and boys in Natureluur. Having seen the statistics of the area, it could be due to the high level of subjective insecurity (Statistiek van Amsterdam 2012) or social constraints.

## 5.3. Questionnaires

During the fieldwork 75 parents were asked about some matters regarding to the playground use. In particular we asked how many times they used to go to the particular playground per week, for how many hours per day on average, which are the main reasons they go to this particular playground, where do they live (in order to know the distance they travel to go to the playground) and the level of importance of certain natural aspects on the playground. Practically over 100% of the people asked accepted to do the questionnaire. However the main constrain found was my difficulty to speak Dutch, which was a difficulty particularly in the playgrounds of Steve Bikoplein and Jouberstraat.

### 5.3.1. DURATION OF THE VISIT AND VISIT FREQUENCY

The duration of the stance does not undoubtedly illustrate any correlation (figure 7) with the naturalness of the playground. However, reading through the percentages there are some figures that need to be mentioned.

In the Joubestraat and Steve Bikoplein, as well as in Frankendael, Willem de Zwijgerlaan and Oosterpark, most of the people stated they used to stay there between less than an hour and two hours. On the other hand parents in Plan west, Woeste westen and Natureluur said more frequently 3 h.

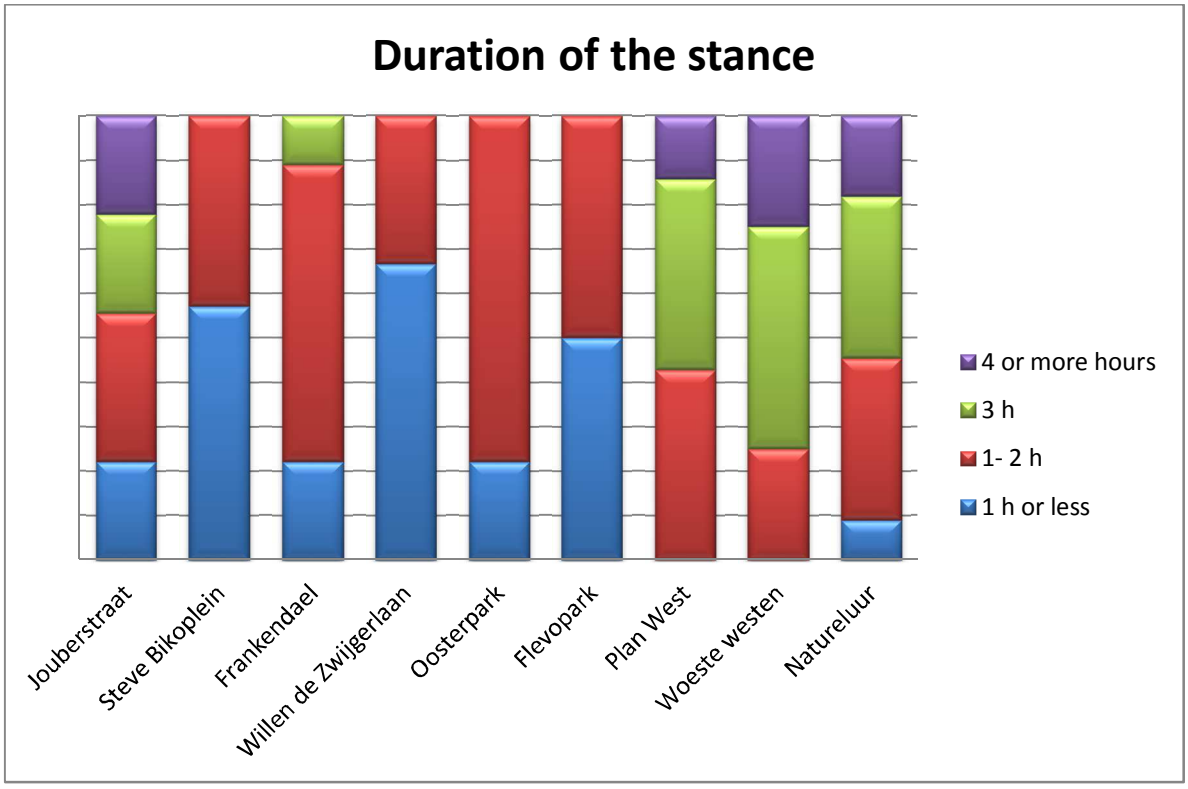



Figure 7 Stance duration in playground. Note: Playgrounds ranked from less (left) to more (right) natural

In fact the three more natural playgrounds are those where, as average, parents stay longer. Woeste westen (3 h), Plan West (2,7 h) and Natureluur (2,6 h) are the three playgrounds where parents stay more time. Howeve Joiberstraat (2,4 h) is the fourth more attractive for spending time, in front of Oosterpark (1,8 h), Frankendael (1,7 h), Flevopark (1,5 h), Steve Bikoplein (1,4 h ) and Willem de Zwijgerlaan (1,3 h).

On the other hand, the visit's frequency shows another dynamic (figure 8). 75% of parents interviewed in Jouberstraat used to go 4 or more days per week. In Steve Bikoplein the same amount of parents stated to go 1 or less days and 4 or more. Yet, in the more natural

playgrounds Plan West (85,7%), Woeste westen (75%) , Natureluur (63,6%), Willem de Zwijgerlaan (100%) and Frankendael (50%)  the majority of parents answered they used to go 1 or less days per week. The only exceptions were Oosterpark (45,5%) and Flevopark (31,3%), where a majority of parents answered 2 days per week.

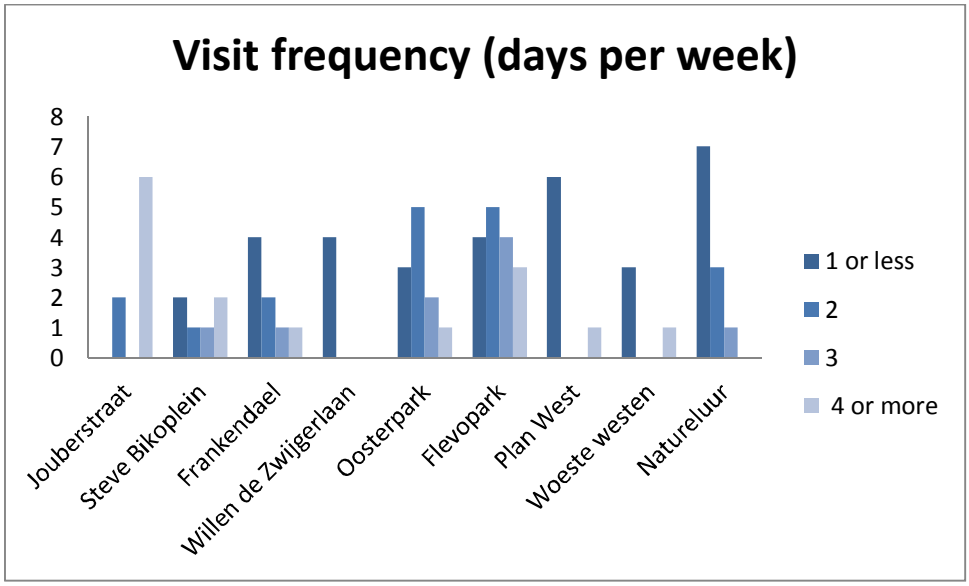



Figure 8 Visit frequency (days per week).Note: Playgrounds ranked from less (left) to more (right) natural

For instance the above graphic illustrates how the one hour option constantly rises from left (less natural playgrounds) to right (more natural).

### *5.3.2. DISTANCES*

The survey results show that visitors travel more to go to the more natural playgrounds (figure 9). The lesser the playground`s naturalness, the more local they are in attracting visitors. The extreme cases are those of Steve Bikoplein and Jouberstraat. Here the majority of the people were residents from the neighbourhood.

Figure number 9 –below- shows the differences in the distances taken by the people going to different playgrounds. It is remarkable the highest distance in Natureluur –more than 10 km. On the other hand the differences between either the average or the maximum distances for the less natural playgrounds are small. This fact strengthens the idea that those areas are more used by the vicinity. This reality accommodates well with the concept of playground resident (Karsten, 2003a), according to which the playground is a prolongation of the user's home. Probably this state has not been reached in Natureluur due to its recent construction and hard accessibility infrastructure.

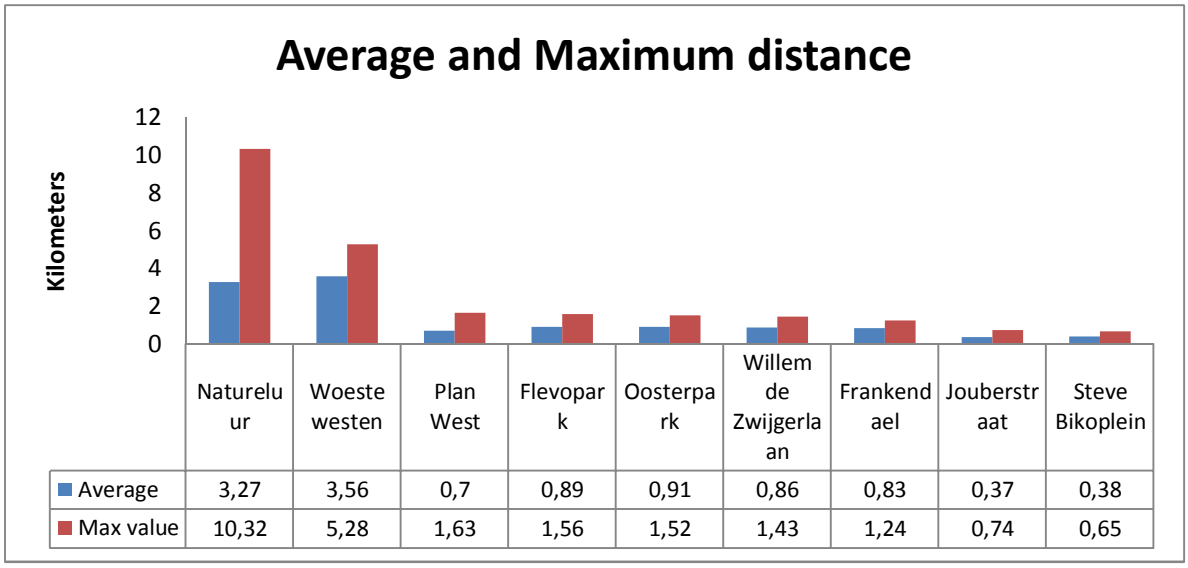



Figure 9 Average and maximum distances. Note: Playgrounds ranked from the most (left) to the less natural (right)

Another data that needs to be highlighted is the differences between the distances of the two more natural playgrounds –Natureluur and Woeste westen- with the rest. As stated before, these two playgrounds are by far the most natural, and people seem to feel more attracted to them than to the others. Therefore the calling effect of this typology of playgrounds might be higher.

### *5.3.3. PARENT`S OPINIONS ABOUT NATURAL ELEMENTS PRESENT ON THE PLAYGROUND*

The second part of the questionnaire was aimed to know the parent's opinions about the importance they give to each aspect characterizing the naturalness of a playground; ground level, natural ground, the possibility for children to play with nature and the green environment surrounding the park.

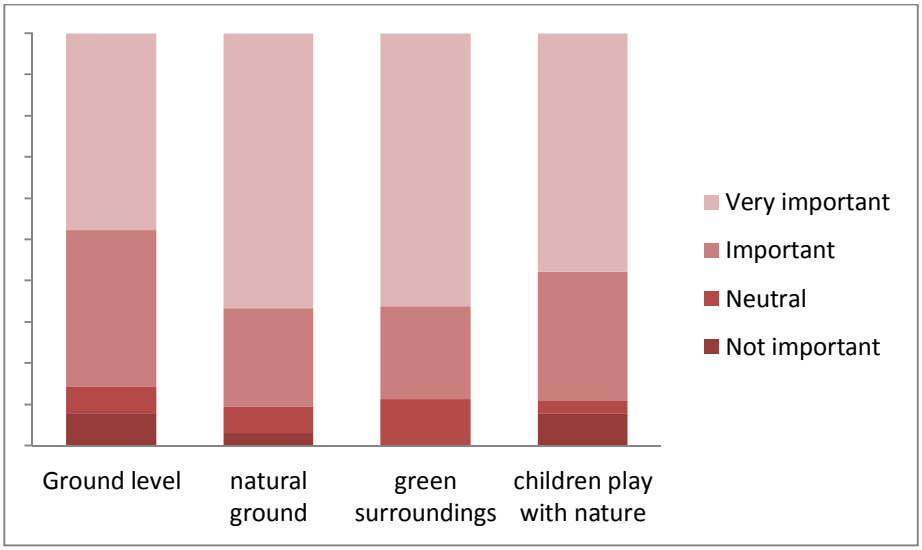



Figure 10 Parent's opinion on playground's natural aspects

Parents give more importance to the existence of a natural ground (grass, sand, etc.) and the surroundings of a park (e.g. if it is within a park) than to the other characteristics –figure 10. Ground level (the existence of trenches, hills, etc.) is the least valued feature, together with the possibility of children to play with nature. However these tendencies are driven by the place where the parents were interviewed. Answers like "I do not like my son/daughter to be dirty were more common in vicinities as Oost".

There are not remarkable differences in the importance that parents give to the variation of the ground level –figure 11 below-, and the majority think is an important factor. However in parks with low variation such as Jouberstraat, Frankendael and Woeste westen people seemed more sceptical about the ground level.

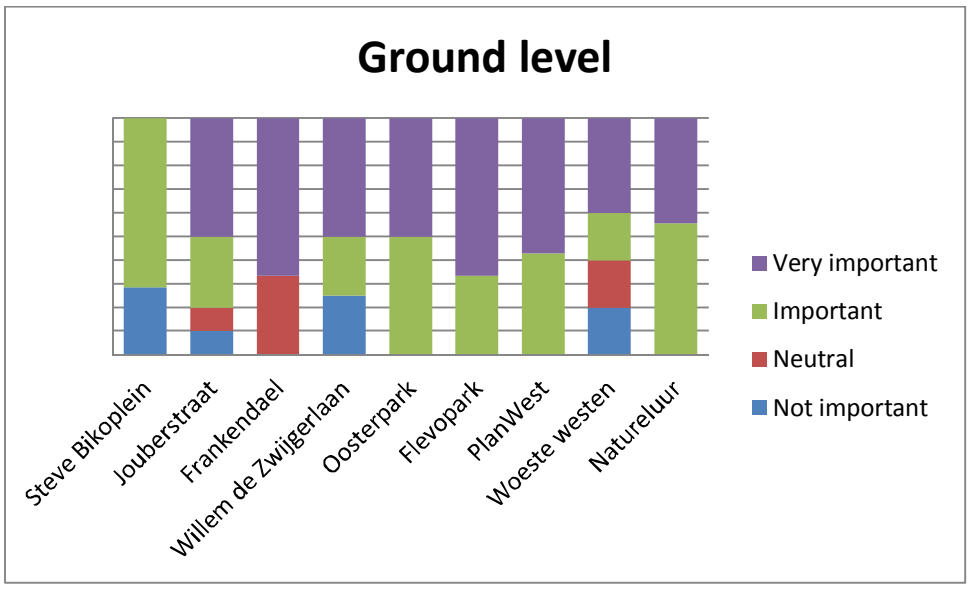



**Figure 11 Importance given to parents to the ground level. Note: Playgrounds ranked from less natural (left) to more natural (right)**

In the case of the existence of a natural ground (e.g. sand, grass), the differences seem to be lesser than in the previous case. Here, for the majority of the parents consulted this factor is important or very important. Still the interesting case is the opinion of the parents asked in the less natural playgrounds. Both in Steve Bikoplein and Jouberstraat –if so in Jouberstraat there was one not important response-, there surface is predominantly asphalt. The concern of parents in this case was the safety given by a natural ground in case of a children's fall.

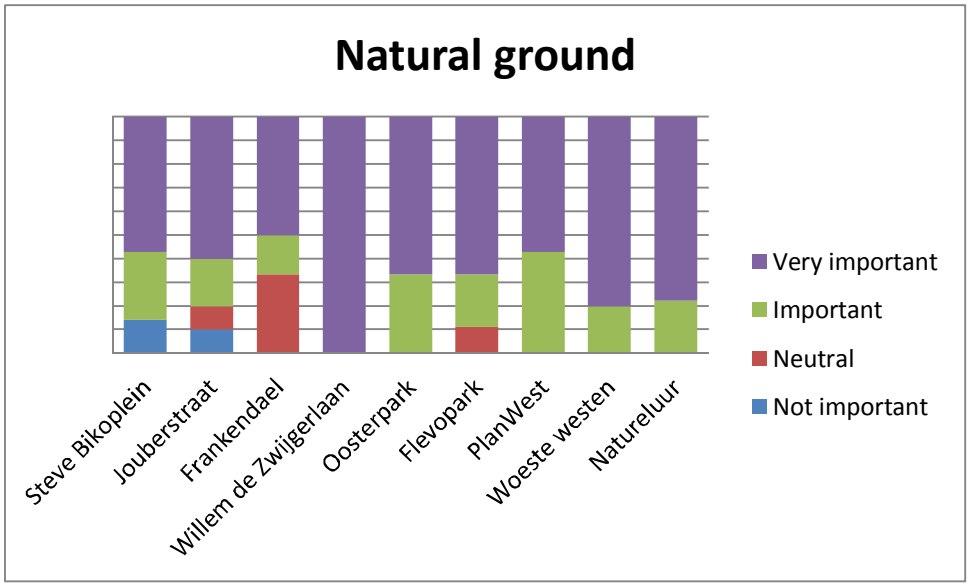



Figure 12 Importance given by parents to the existance of a natural ground.

Also the case of the playground Willem de Zwijgerlaan is remarkable. The playground's most important natural element is precisely the sand and grass, which shape the whole playground. Here all the parents asked agreed on the importance of the natural ground.

One of the most important values of a natural playground is the accessibility of nature for the children to play with. The figure below – figure 13- shows that "very important" is the most common response for the parents asked in the most natural playgrounds (Woeste weste and Natureluur). On the contrary, In Steve Bikoplein and Joubestraat there is a considerable percentage of people (most in the case of Bikoplein) who does not think important their children to play with nature.

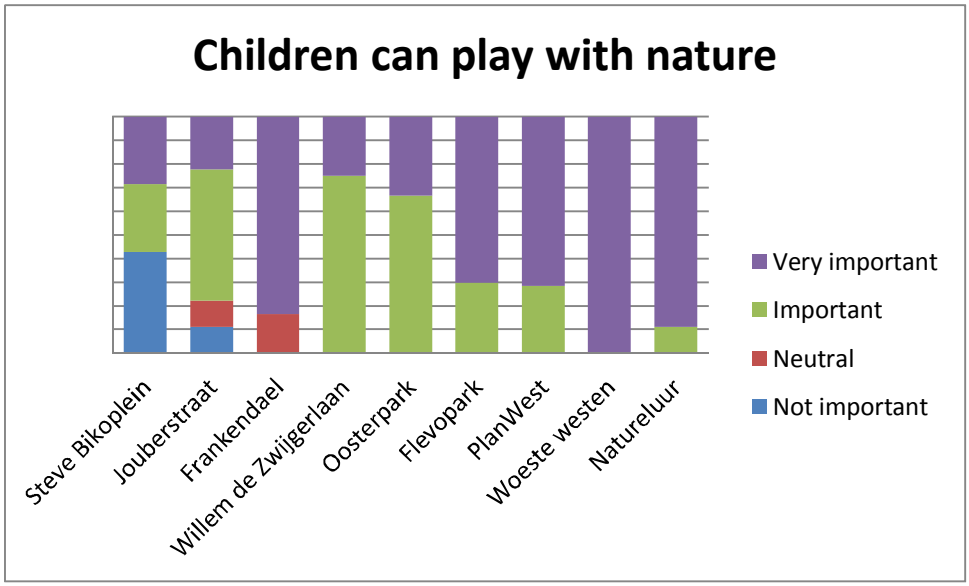



**Figure 13Importance given to parents to the availability of nature to play with. Note: Playgrounds ranked from less natural (left) to more natural (right)**

Again, also in the less natural playgrounds this aspect is important to parents. However the only "not important" response was obtained in Joubestraat. It is also interesting to see how the number of people responding "important" decreases as the "very important" increases as the playgrounds becomes more natural.

The last natural aspect we asked about to parents was the importance they give to the green surroundings- figure 14. The trend we can observe is very similar to the previously commented. However in this case people respond more often "neutral". If we take into consideration the "positive" way in which this questionnaire was done –see discussion- this response can be taken closer to "not important" than to "important".

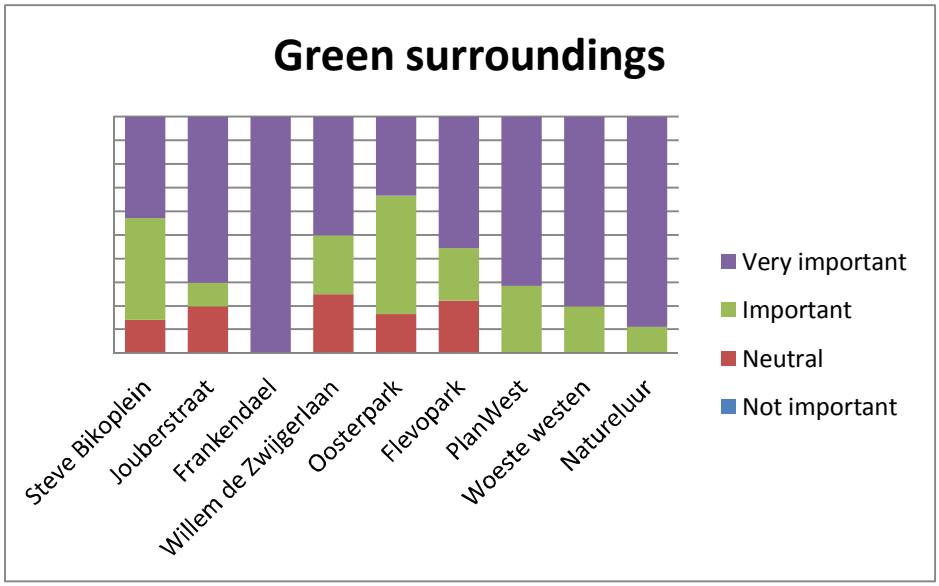



**Figure 14 Importance given to parents to the existeence of the green surroundings. Note: Playgrounds ranked from less natural (left) to more natural (right)**

Still it is surprising the response in Flevopark. This playground is located in one of the main natural spots of the city, with a somehow unmanaged forest surrounding it. One would have expected more awareness of parents to this environment. On the other hand, Plan West which is located in the centre of a neighbourhood had a population of parents very aware of the green surroundings. People give to nature is greater when nature is scarce (Aslan, 2013), in this case the people living in a more urbanized environment.

### *5.3.4. MAIN REASONS FOR GOING TO THE PARTICULAR PLAYGROUND*

The main reason of parents to go to a particular playground is distance -table 4. Only in the most natural playgrounds the naturalness is an important reason. There is a tendency indicating that as the naturalness of a playground increases, distance-driven reasons decrease. The environment is also an important factor for parents when choosing a particular playground. Logically this reason was given principally in playgrounds located in parks. However some 10% of the parents in Joubestraat and Steve Bikoplein stated this reason.

| | distance | environment | naturalness | safety | cleanliness | size | variety | social | activities |
|---|---|---|---|---|---|---|---|---|---|
| **Jouberstraat** | 38,1 | 9,5 | 0,0 | 7,1 | 0,0 | 2,4 | 9,5 | 7,1 | 0,0 |
| **Steve Bikoplein** | 58,3 | 8,3 | 0,0 | 4,2 | 0,0 | 4,2 | 8,3 | 0,0 | 0,0 |
| **Frankendael** | 31,6 | 21,1 | 5,3 | 7,9 | 0,0 | 0,0 | 7,9 | 2,6 | 0,0 |
| **Willen de Zwijgerlaan** | 42,9 | 0,0 | 7,1 | 0,0 | 0,0 | 0,0 | 21,4 | 0,0 | 0,0 |
| **Oosterpark** | 35,7 | 28,6 | 3,6 | 5,4 | 0,0 | 0,0 | 8,9 | 0,0 | 0,0 |
| **Flevopark** | 22,2 | 22,2 | 9,7 | 2,8 | 4,1 | 4,2 | 8,3 | 0,0 | 0,0 |
| **Plan West** | 16,7 | 11,1 | 13,9 | 8,3 | 0,0 | 0,0 | 11,1 | 0,0 | 5,3 |
| **Woeste westen** | 11,1 | 22,2 | 27,8 | 0,0 | 0,0 | 5,6 | 0,0 | 0,0 | 0,0 |
| **Natureluur** | 18,2 | 4,5 | 29,5 | 0,0 | 0,0 | 0,0 | 9,1 | 0,0 | 0,0 |

**Table 4 Reasons for the selection of a playground. Numbers gave in percentage. Distance (distance to home or school); environment (location of the playground); naturalness (natural elements present on the playground); safety (subjective safety feeling); cleanliness; size; variety (variety of playing devices/oportunities); social (as contact social for parents); activities (activities being performed by the personnel of the playground). In yellow the stated main reason on each playground.**

# 6. DISCUSSION

## 6.1. OBSERVATIONS

In general it can be noticed the more usage levels in those playgrounds with higher rates of naturalness -figure 15. According to the observation results, when available, children use nature to play rather than traditional ball-focused sports. Despite it was not found solid evidence, there are some hints indicating this could enhance the contact and mixture between boys and girls. For example we counted more girls than boys in Woeste westen – literature review shows 2/3 of children in playgrounds are boys. This could be an important benefit given by natural playgrounds. However the lack of girls in Natureluur is unusual. It could be due other factors such as the subjective insecurity index (in this district is high), the complicated and not attractive accessibility or particular social reasons.

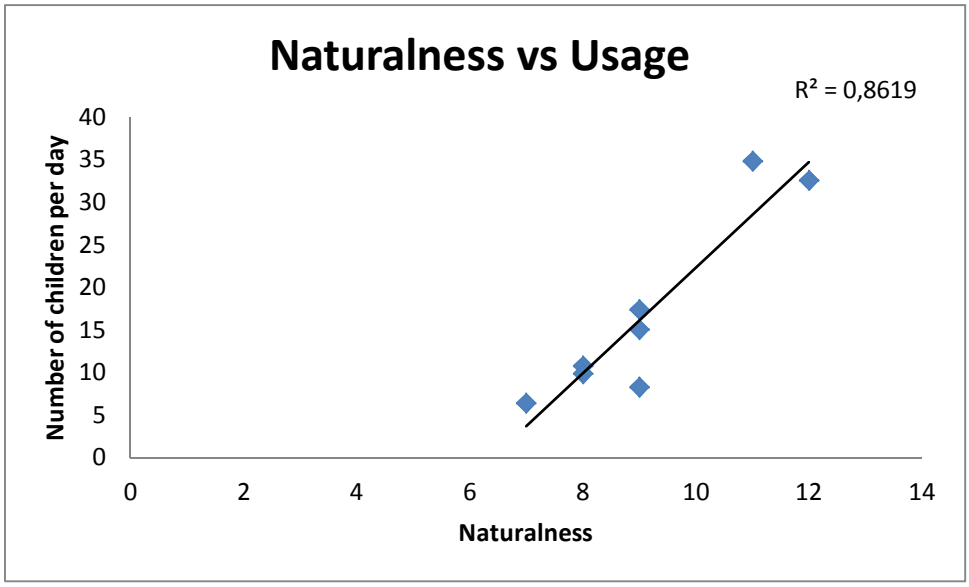



Figure 15 Naturalness vs. Usage

For instance ordinary sports such as football or biking are marginal activities in those playgrounds with more natural character -Figure 16. An illustrative example of segregation by playing activities is Jouberstraat. In this playground there exist three different areas: a football court, a table tennis place (very successful) and ordinary playing devices. With this organisation one can observe how all the boys are usually playing table tennis or football, whilst the girls are usually in the playing devices. According to some interviewed parents football could be a source of annoyance for them, moreover when they have toddlers.

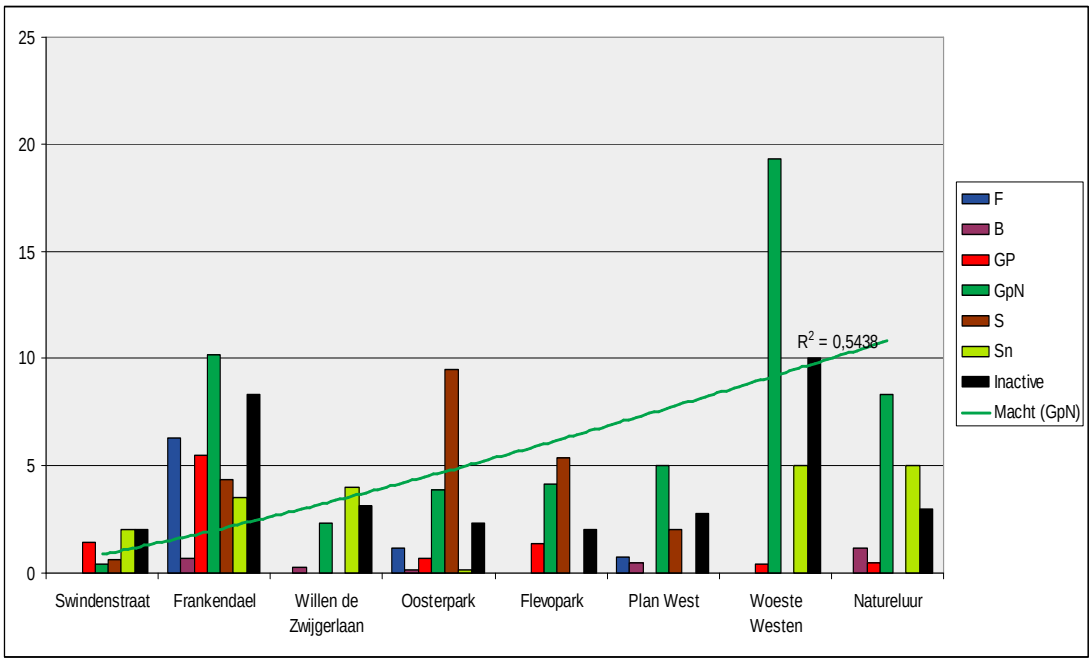



**Figure 16 Play type distribution per playground. Note: Playgrounds ranked from less natural (left) to more natural (right). The green line epresent the trendline of General Play with Nature.**

Water seems to be the most important natural element for children and parents to decide whether to go to a playground. Accounting that this work was carried out in summer, the presence or absence of water bodies is fundamental for the popularity of a playground. Still one common concern was the quality of the water, which in some cases seem to be low. However there are different variables influencing the use of the playgrounds and naturalness might be just one of them. For instance the differences in use between Woeste westen and Natureluur could not be due the naturalness, since both have similar elements. Rather, it should be due other aspects. Apart from the ones previously commented, the lack of toilets, benches and concession stands to buy drinks or water is very influential factor.

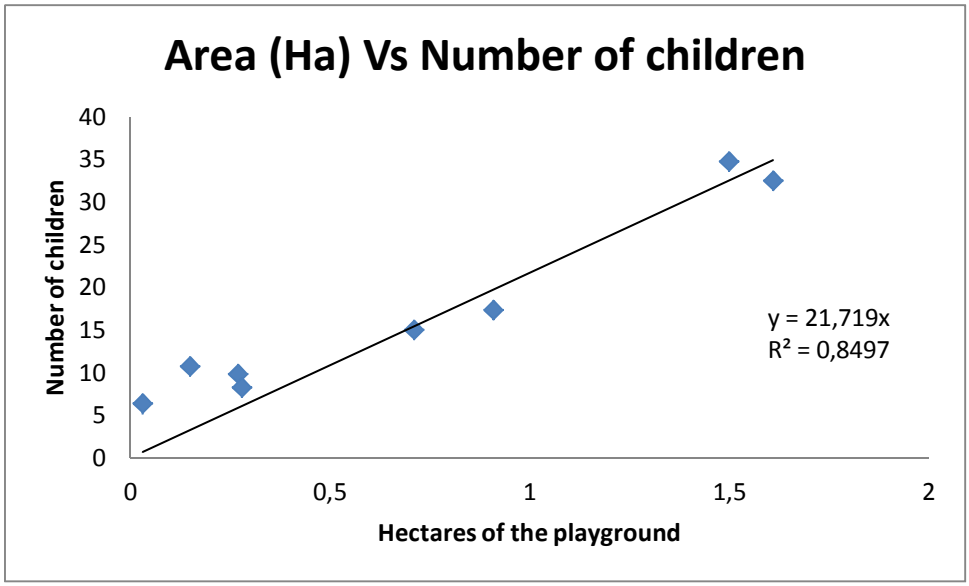



Figure 17 Area vs density of children in the playground),

## 6.2. Questionnaires

In general nature is an important factor for the parents. This can be demonstrated not only by means of the questionnaires –which responses might be biased by the personal or environmental circumstances- , but also with the distances they travel to allow their children to play with nature. In fact, the time spent on travel is a constraint which could affect more than others –e.g. money- when selecting a recreational place (Bockstael et al., 1987). In line with this argument, it was observed that the naturalness of a playground make people travel from different districts to play with nature.

Therefore a side effect could be that natural playgrounds would enhance social cohesion by mixing different people coming from different boroughs of the city. To support this affirmation is some parent's opinion in Steve Bikoplein and Jouberstraat; they would like their children to play with others coming from different backgrounds in order to favour the integration of their own. Besides the main reason due to which parents usually choose a non natural playground seems to be the distance.

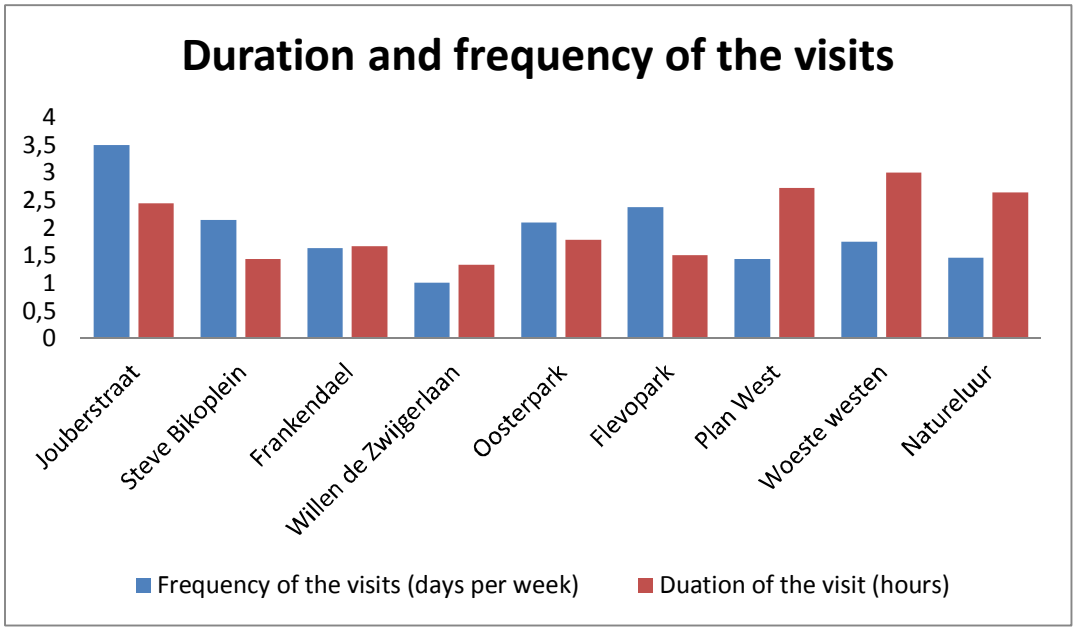



**Figure 18 Duration (hours) and frequency of the visits (days per week). Note: Playgrounds ranked from less (left) to more (right) naturalness**

According also to Bockstael et al. (1987),time on site is also a factor to take into account when stating the value people give to a scarce good. Parents' presence on the playground was longer in those more natural. However this frequency of attendance to Woeste weste and Natureluur was low. This indicates parents attendance to these places has some extraordinarily character. For instance staff working in Woeste westen said during the weekends the playground is very popular.

Asked about natural elements constituting the naturalness of a playground, the most important was the natural ground (important also for safety reasons) and the green surroundings, followed by the possibility of the children to play with nature and the differences in topography. Most of the neutral or negative answers were gathered in those parks with less nature (Steve Bikoplein and Jouberstraat). It is a remarkable fact that three parents did not like their children to play with nature, mainly because they do not want them to get dirty.

According to some comments of the parents, favouring of creativity development is also very important for them. In fact the playing with nature has been shown to enhance creativity – amongst other psychological abilities- in children (Charles, 2009).

## 6.3. Limitations

The present report is limited due mainly to a) methodological reasons and b) the uncertainty arising from all the uncontrolled factors that may influence the results.

Direct observations is a valuable method to assess the use of the playgrounds in a certain area; however there are methodological limitations that threatens its feasibility (Engelhard et al., 2001; Patterson et al., 1988). Observers should be trained before carrying out the measures in order to improve the reliability of their observations(Taplin and Reid, 1973). Before the field work there was only one session of training, which could have been not enough. In addition the protocol developed was not previously tested, even though it has resulted in a feasible procedure.

Even if observation is a reliable method, its validity could be limited. For instance, I and my colleague could agree in the gender of one child, and both of us being wrong. This could be aggravated by the commented lack of training.

The sample size was probably too big, if we take into consideration the limit number of observers or time. It means that the six-time visits –on average- to the playgrounds are not enough. It could probable had been more appropriate to shorten the number of playgrounds and spend more time on each.

Questionnaires were the other method used during the fieldwork. Apart from the accuracy of each subject's responses, the second part of the questionnaire was stated in a *positive* way. With the experience acquired during the fieldwork, it would have been more suitable asking the interviewee to do a ranking. From my perspective this way would help to give a better idea about the real priorities of parents when choosing a particular playground. Besides a personal problem is the limited amount of information I gathered in comparison with my Dutch-speaker colleague. In some districts –mostly in those less favoured neighbourhoods- I could hardly communicate with the citizens.

Finally the assessment of playground naturalness is new in literature, and no such a concept has been assessed. As one can understand there are hundreds of variables (i.e. biodiversity index) and methods (phytosociological inventory, RI assessment) which would better objectively assess the naturalness of a playground. However In my opinion the subjective impression of naturalness could be more important than a science-based method. In

addition this was a straightforward method which did not require a lot of time and resources.  Within a method, a main weakness is the assumption that all the naturalness factors –ground, topography, green surroundings and children playing with nature- have the same importance.

Apart from the methodological limitations, there are uncontrolled variables which have a direct effect in the use of the public space. For instance factors like the weather definitely influence the use. However this variable was limited since several rounds were done during the same day. On the other hand there are also social constraints that would impact the use of the playgrounds and social and cultural factors (Stodolska and Livengood, 2006). For example, the Muslim festivity of Ramadan –occurring during the measures-or summer holidays could have an effect.

Therefore the social characteristics of each neighbourhood could play an important role in the amount of children playing in the parks. But also each neighbourhood's demographic qualities are definitely important. For instance, some level of correlation was found when comparing the population density of each neighbourhood with the use of the natural playground.

# 7. CONCLUSSION

This research was a pilot study of the use of playgrounds in Amsterdam. Those playgrounds with higher natural character –naturalness- were amongst the most used. At least in these playgrounds children prefer to use nature to play with rather than ordinary sports such as football or biking.

Amongst all the variables that makes a playground successful or not, naturalness is another influential factor. However the fact of parent's commuting with their children from much farer away in those natural playgrounds rather than in the ordinary ones demonstrates naturalness is a very important variable.

Moreover this fact could strengthen the social capital of the city mixing people from different backgrounds. Less natural, more ordinary playgrounds are characterized by a very stable population and could be very impermeable to the mix of social backgrounds and people. Also naturalness seems to be an important feature that could help to avoid gender segregation. However more research would be needed to confirm the latest.

We also asked about the factors influencing the use of the natural playgrounds. However such a study should encompass several phases and be extended in time and resources. Based on parent's opinions and observations made, factors such as presence of water, presence of services and concession stands and facilities are amongst the most important factors mentioned by parents. The next step would be to weight and rank this aspects to establish until which extend they are important.

# 8. REFERENCES


Arbogast, K.L., Kane, B.C.P., Kirwan, J.L., Hertel, B.R. (2009) Vegetation and outdoor recess time at elementary schools: What are the connections? Journal of Environmental Psychology 29, 450-456.

Aslan, F. (2013) Levels of awareness and points of view to nature for adolescents according to urban and rural areas: Case of Malatya province, Turkey. Journal of Food, Agriculture and Environment 11, 795-800.

Bedimo-Rung, A., Gustat, J., Tompkins, B., Thomson, J. (2006) Development of a direct observation instrument to measure environmental characteristics of parks for physical activity. Journal of Physical Activity and Health 3, 13.

Bennet, S.A., Yiannakoulias, N., Williams, A.M., Kitchen, P. (2012) Playground Accessibility and Neighbourhood Social Interaction Among Parents. Social Indicators Research 108, 199-213.

Bockstael, N.E., Strand, I.E., Hanemann, W.M. (1987) Time and the recreational demand model. American Journal of Agricultural Economics 69, 293-302.

Cameron, R.W.F., Blanuša, T., Taylor, J.E., Salisbury, A., Halstead, A.J., Henricot, B., Thompson, K. (2012a) The domestic garden - Its contribution to urban green infrastructure. Urban Forestry and Urban Greening 11, 129-137.

Cameron, R.W.F., Blanuša, T., Taylor, J.E., Salisbury, A., Halstead, A.J., Henricot, B., Thompson, K. (2012b) The domestic garden – Its contribution to urban green infrastructure. Urban Forestry & Urban Greening 11, 129-137.

CBS, (2010) Centraal Bureau voor de Statistiek.

Cohen, D.A., Marsh, T., Williamson, S., Derose, K.P., Martinez, H., Setodji, C., McKenzie, T.L. (2010) Parks and physical activity: Why are some parks used more than others? Preventive Medicine 50, S9-S12.

Colabianchi, N., Maslow, A.L., Swayampakala, K. (2011) Features and amenities of school playgrounds: A direct observation study of utilization and physical activity levels outside of school time. International Journal of Behavioral Nutrition and Physical Activity 8.

Coombes, E., Jones, A.P., Hillsdon, M. (2010) The relationship of physical activity and overweight to objectively measured green space accessibility and use. Social Science and Medicine 70, 816-822.

Charles, C. (2009) The ecology of hope: Natural guides to building a children and nature movement. Journal of Science Education and Technology 18, 467-475.

Davies, Z.G., Edmondson, J.L., Heinemeyer, A., Leake, J.R., Gaston, K.J. (2011) Mapping an urban ecosystem service: quantifying above-ground carbon storage at a city-wide scale. Journal of Applied Ecology 48, 1125-1134.

de Vries, S., Verheij, R.A., Groenewegen, P.P., Spreeuwenberg, P. (2003) Natural environments - Healthy environments? An exploratory analysis of the relationship between greenspace and health. Environment and Planning A 35, 1717-1731.

Engelhard, S., Stubbs, J., Weston, P., Fitzgerald, S., Giles-Corti, B., Milat, A.J., Honeysett, D. (2001) Methodological considerations when conducting direct observation in an outdoor

environment: Our experience in local parks. Australian and New Zealand Journal of Public Health 25, 149-151.

Fjørtoft, I. (2001) The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children. Early Childhood Education Journal 29, 111-117.

Fjørtoft, I., Sageie, J. (2000) The natural environment as a playground for children. Landscape description and analyses of a natural playscape. Landscape and Urban Planning 48, 83-97.

Fontaine, K.R., Redden, D.T., Wang, C., Westfall, A.O., Allison, D.B. (2003) Years of life lost due to obesity. Journal of the American Medical Association 289, 187-193.

Groenewegen, P.P., van den Berg, A.E., Maas, J., Verheij, R.A., de Vries, S. (2012) Is a Green Residential Environment Better for Health? If So, Why? Annals of the Association of American Geographers 102, 996-1003.

Gundersen, C., Mahatmya, D., Garasky, S., Lohman, B. (2011) Linking psychosocial stressors and childhood obesity. Obesity Reviews 12, e54-e63.

Hillsdon, M., Panter, J., Foster, C., Jones, A. (2006) The relationship between access and quality of urban green space with population physical activity. Public Health 120, 1127-1132.

Hino, A.A.F., Reis, R.S., Ribeiro, I.C., Parra, D.C., Brownson, R.C., Fermino, R.C. (2010) Using observational methods to evaluate public open spaces and physical activity in Brazil. Journal of Physical Activity and Health 7, S146-S154.

Hirokawa, K.H. (2011) Sustainability and the urban forest: An ecosystem services perspective. Natural Resources Journal 51, 233-259.

Kaczynski, A.T., Potwarka, L.R., Saelens P, B.E. (2008) Association of park size, distance, and features with physical activity in neighborhood parks. American Journal of Public Health 98, 1451-1456.

Kaczynski, A.T., Wilhelm Stanis, S.A., Besenyi, G.M. (2012) Development and testing of a community stakeholder park audit tool. American Journal of Preventive Medicine 42, 242-249.

Karsten, L. (1998) Growing up in Amsterdam: Differentiation and segregation in children's daily lives. Urban Studies 35, 565-581.

Karsten, L. (2002) Mapping childhood in Amsterdam: The spatial and social construction of children's domains in the city. Tijdschrift voor Economische en Sociale Geografie 93, 231-241.

Karsten, L. (2003a) Bleak prospects? Urban planning, family housing and children's outdoor spaces in the capital of the Netherlands. Children's Geographies 1, 295-298.

Karsten, L. (2003b) Children's use of public space: The gendered world of the playground. Childhood 10, 457-473.

Karsten, L. (2005) It all used to be better? different generations on continuity and change in urban children's daily use of space. Children's Geographies 3, 275-290.

Karsten, L. (2011) Children's social capital in the segregated context of Amsterdam: An historical-geographical approach. Urban Studies 48, 1651-1666.

Larondelle, N., Haase, D. (2013) Urban ecosystem services assessment along a rural-urban gradient: A cross-analysis of European cities. Ecological Indicators 29, 179-190.

Maas, J., Verheij, R.A., De Vries, S., Spreeuwenberg, P., Schellevis, F.G., Groenewegen, P.P. (2009) Morbidity is related to a green living environment. Journal of Epidemiology and Community Health 63, 967-973.

Maas, J., Verheij, R.A., Groenewegen, P.P., De Vries, S., Spreeuwenberg, P. (2006) Green space, urbanity, and health: How strong is the relation? Journal of Epidemiology and Community Health 60, 587-592.

McCormack, G.R., Rock, M., Toohey, A.M., Hignell, D. (2010) Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. Health & Place 16, 712-726.

McGee Iii, J.A., Day, S.D., Wynne, R.H., White, M.B. (2012) Using geospatial tools to assess the urban tree canopy: Decision support for local governments. Journal of Forestry 110, 275-286.

McKenzie, T.L., Marshall, S.J., Sallis, J.F., Conway, T.L. (2000) Leisure-time physical activity in school environments: An observational study using SOPLAY. Preventive Medicine 30, 70-77.

Nordström, M. (2010) Children's views on child-friendly environments in different geographical, cultural and social neighbourhoods. Urban Studies 47, 514-528.

Owen, N., Leslie, E., Salmon, J., Fotheringham, M.J. (2000) Environmental determinants of physical activity and sedentary behavior. Exercise and Sport Sciences Reviews 28, 153-158.

Patterson, P.D., Moore, C.G., Probst, J.C., Shinogle, J.A. (2004) Obesity and Physical Inactivity in Rural America. Journal of Rural Health 20, 151-159.

Patterson, T.L., Sallis, J.F., Nader, P.R., Rupp, J.W., McKenzie, T.L., Roppe, B., Bartok, P.W. (1988) Direct observation of physical activity and dietary behaviors in a structured environment: Effects of a family-based health promotion program. Journal of Behavioral Medicine 11, 447-458.

Payne, R., Johnson, R. (1985) Patterns of recreation services and facilities in an urban environment: the case of Kitchener Ontario. Recreation Research Review 12, 39-45.

Pikora, T.J., Bull, F.C.L., Jamrozik, K., Knuiman, M., Giles-Corti, B., Donovan, R.J. (2002) Developing a reliable audit instrument to measure the physical environment for physical activity. American Journal of Preventive Medicine 23, 187-194.

Reed, J.A., Hooker, S.P. (2012) Where are youth physically active? A descriptive examination of 45 parks in a southeastern community. Childhood Obesity 8, 124-131.

Refshauge, A.D., Stigsdotter, U.K., Cosco, N.G. (2012) Adults' motivation for bringing their children to park playgrounds. Urban Forestry & Urban Greening 11, 396-405.

Rehrer, N.J., Freeman, C., Cassidy, T., Waters, D.L., Barclay, G.E., Wilson, N. (2011) Through the eyes of young people: Favourite places for physical activity. Scandinavian Journal of Public Health 39, 492-500.

Sallis, J.F., Bauman, A., Pratt, M. (1998) Environmental and policy interventions to promote physical activity. American Journal of Preventive Medicine 15, 379-397.

Sallis, J.F., Hovell, M.F., Hofstetter, C.R., Elder, J.P., Hackley, M., Caspersen, C.J., Powell, K.E. (1990) Distance between homes and exercise facilities related to frequency of exercise among San Diego residents. Public Health Reports 105, 179-185.

Schäffler, A., Swilling, M. (2012) Valuing green infrastructure in an urban environment under pressure - The Johannesburg case. Ecological Economics.

Siu, V.W., Lambert, W.E., Fu, R., Hillier, T.A., Bosworth, M., Michael, Y.L. (2012) Built environment and its influences on walking among older women: Use of standardized geographic units to define urban forms. Journal of Environmental and Public Health 2012.

Sorensen, A., Okata, J., (2011) Introduction: Megacities, Urban Form, and Sustainability

Megacities, in: Sorensen, A., Okata, J. (Eds.). Springer Japan, pp. 1-12.

Stodolska, M., Livengood, J.S. (2006) The influence of religion on the leisure behavior of immigrant Muslims in the United States. Journal of Leisure Research 38, 293-320.

Strong, W.B., Malina, R.M., Blimkie, C.J.R., Daniels, S.R., Dishman, R.K., Gutin, B., Hergenroeder, A.C., Must, A., Nixon, P.A., Pivarnik, J.M., Rowland, T., Trost, S., Trudeau, F. (2005) Evidence based physical activity for school-age youth. Journal of Pediatrics 146, 732-737.

Taplin, P.S., Reid, J.B. (1973) Effects of instructional set and experimenter influence on observer reliability. CHILD DEVELOP. 44, 547-554.

Tappe, K.A., Glanz, K., Sallis, J.F., Zhou, C., Saelens, B.E. (2013) Children's physical activity and parents' perception of the neighborhood environment: Neighborhood impact on kids study. International Journal of Behavioral Nutrition and Physical Activity 10.

van Dillen, S.M.E., de Vries, S., Groenewegen, P.P., Spreeuwenberg, P. (2012) Greenspace in urban neighbourhoods and residents' health: Adding quality to quantity. Journal of Epidemiology and Community Health 66.

van Herzele, A., de Vries, S. (2012) Linking green space to health: A comparative study of two urban neighbourhoods in Ghent, Belgium. Population and Environment 34, 171-193.

Verstrate, L., Karsten, L. (2011) The creation of play spaces in twentieth-century Amsterdam: From an intervention of civil actors to a public policy. Landscape Research 36, 85-109.

von Benzon, N. (2011) Who's afraid of the big bad woods? Fear and learning disabled children's access to local nature. Local Environment 16, 1021-1040.

Walker, L., Ashley, R., Nowell, R., Gersonius, B., Evans, T., (2012) Surface water management and urban green infrastructure in the UK: A review of benefits and challenges.

Wells, N.M., Evans, G.W. (2003) Nearby nature: A buffer of life stress among rural children. Environment and Behavior 35, 311-330.

Wilcox, S., Castro, C., King, A.C., Housemann, R., Brownson, R.C. (2000) Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. Journal of Epidemiology and Community Health 54, 667-672.

Wilson, S.M., Sato, A.F. (2013) Stress and paediatric obesity: What we know and where to go. Stress and Health.

# APPENDIX I QUESTIONNAIRE

**Park:**

**How often do you come to this playground?**

**Why do you come to this playing area?**

Main reason: Secondary reason:
Other:

**Do you prefer other playground?** **Which one?**

**Why you do not go?**

Main reason: Secondary reason: Other:

**For how long do you usually come to this playground?**

**Can you tell me your Postal code?***

**Hoe belangrijk vindt u dat de speelplek:**

- Verschillende hoogteniveaus's heeft (heuvels, klimbomen) 0 1 2 3
- Een natuurlijke ondergrond heeft (houtsnippers, gras, zand) 0 1 2 3
- Dat de omgeving van de speelplaats groen is: 0 1 2 3
- Dat de kinderen met natuurlijke elementen kunnen spelen: 0 1 2 3
  (zand, bomen, gras, struiken, water, modder)

**Are there any negative aspects of your children playing with natur**

## APPENDIX II COUNTING FORM

| Area | Age | Man | Woman | F | B | GP | GPn | S | Sn | Inactive | Unsocial | Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-2 | | | | | | | | | | | |
| | 2-12 | | | | | | | | | | | |
| | 12- | | | | | | | | | | | |
| | 1-2 | | | | | | | | | | | |
| | 2-12 | | | | | | | | | | | |
| | 12- | | | | | | | | | | | |
| | 1-2 | | | | | | | | | | | |
| | 2-12 | | | | | | | | | | | |
| | 12- | | | | | | | | | | | |
| | 1-2 | | | | | | | | | | | |
| | 2-12 | | | | | | | | | | | |
| | 12- | | | | | | | | | | | |